*Leaching and Tanning Experiments with Tara Pods

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Tara pods are produced on a shrub or small tree varying in height from five to thirty feet. The tree is rather widely distributed in tropical America in Bolivia, northern Chile, Ecuador, Colombia, Venezuela, and especially Peru which at present is the principal producer.[1] It has been recorded in Cuba and Mexico and has been cultivated in northern Africa.

The tara tree is thorny and produces yellow flowers and fruit in the form of pods that are exceedingly rich in tannin. The pods (Figure I) when dry are rather flat and about four inches long. They are colored pale yellow, red, or yellow tipped with red, and usually contain four to seven round or somewhat flattened seed (Figure II) varying in color from light brown to dark mahogany or black.

The first botanical recognition apparently was that given by Feuillée[1] in about 1714. Since that date several descriptions of tara have appeared under various botanical names[1,2] and there still seems to be some difference of opinion as to which name should be adopted officially.

Sprague[1] states that the names most commonly employed in recent literature are *Caesalpinia tinctoria* (H.B.K.) Taub, and *Caesalpinia pectinata*

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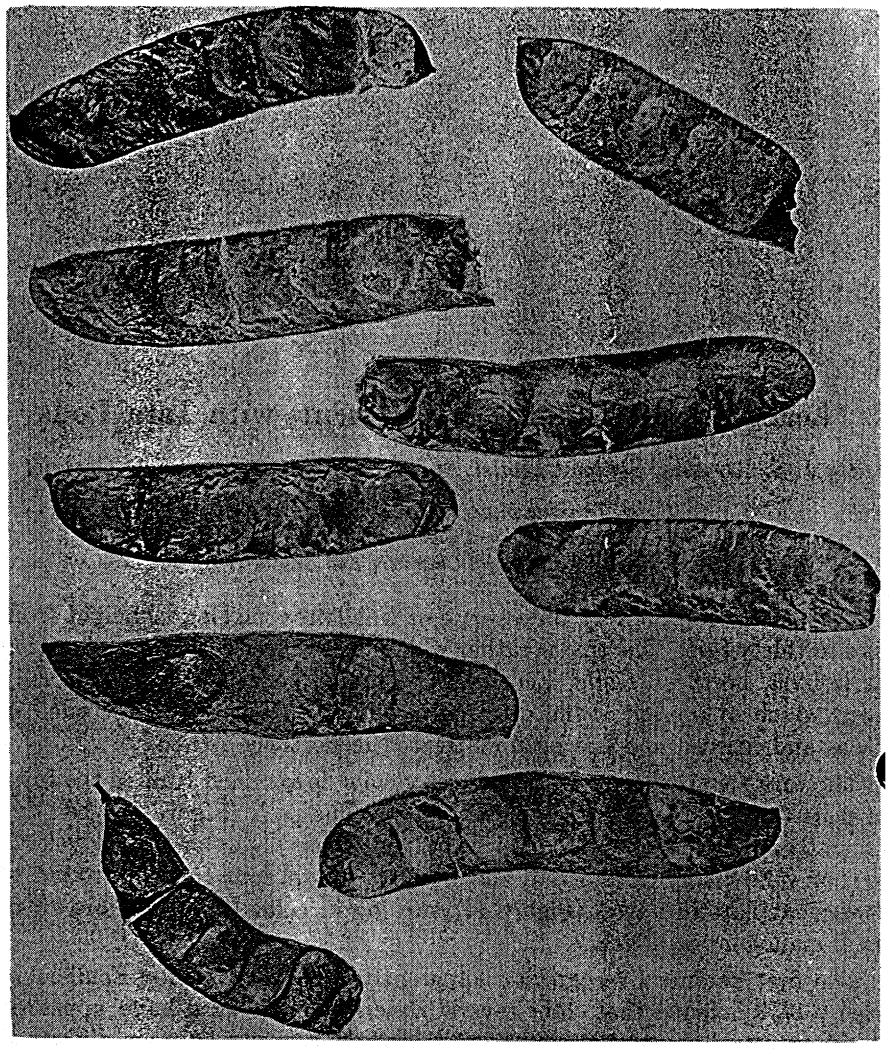

FIGURE I—Tara pods.

Cav. "Under International Rules, however, the correct name for the species is *Caesalpinia spinosa* (Mol.) Kuntze."*

Other American species of *Caesalpinia* of interest because they produce fruit pods rich in tannin are: divi-divi, *C. coriaria* (Jacq) Willd; algarobilla, *C. brevifolia* (Clos) Baill; and cascalote, *C. cacolaco* H. and B. The "teri"

*In Vignolo-Lutati's notes[2] the following names for tara have been listed with dates: 1714 *Poinciana spinosa* Feuillée; 1802 *Caesalpinia pectinata* Cavanilles; 1802 *Caesalpinia tara* Ruiz and Pav.; 1810 *Tara tinctoria* Molina; 1824 *Coulteria tinctoria* H.B.K.; 1824 *Coulteria horrida* H.B.K.; 1825 *Coulteria chilensis* D.C.; 1883 *Caesalpinia tinctoria* Dombey; 1898 *Caesalpinia spinosa* (Molina) Kuntze; 1930 *Tara spinosa* Britton and Rose.

tree of Burma and India, *Caesalpinia digyna* Rottl. is closely related to tara and produces pods that are used in tanning.

Numerous publications dealing with tara pods have appeared from time to time during the last twenty years. Tannin contents have been reported ranging from 40 to 60 per cent in the pods and up to 18 per cent in the leaves. The transplanting and cultivating of tara in other than its native habitat have proved quite successful, particularly in French and Italian colonies. Tara resists drought well but will not stand temperatures colder than –4° or –5° C. It does not appear to require special soils or care. Pods may be harvested twice each year. Annual yields averaging 50 kilograms per full-grown tree and ranging from 25 to 40 kilograms for trees eight years old have been reported.[3] The use of tara pods and tara extracts in tanning is claimed to produce high quality leathers. Used alone or in combination with other materials it has proved successful in tanning a wide variety of leathers including sheep, goat, reptile, saddlery, strap, and shoe leathers.

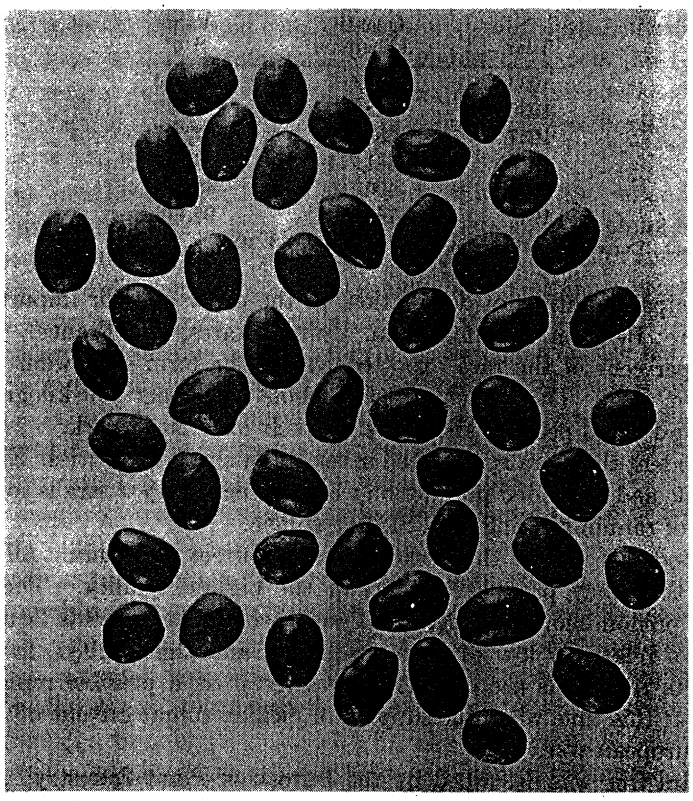

FIGURE II—Tara seed.

For light colored leathers tara rivals Sicilian sumac and has been favorably considered as a replacement for this material. It produces leathers particularly suitable for dyeing light delicate shades.

Tara seed and the gum they contain have been rather extensively studied by Castiglioni[4]. Tara gum closely resembles the gum of carob seed which has been used under the name of "Tragasol" in the textile, dyeing, and tanning industries.

Among the important publications dealing with tara those of Heim and Cercelet,[5] Vignolo-Lutati,[2,6,7,8] Castiglioni,[4] Huc,[9] Bravo[10], Liberi,[11] Calvino,[12] and reviews in Le Cuir Technique[13,14,15] are of particular interest.

A recent article on tara[16] deals with its propagation and production in Peru. One item of particular interest is the statement that young trees begin to bear at two years; and another the mention of separation of pod material, after removal of seed, into fibrous matter and dense powder, the latter containing up to 65 per cent tannin. The exportation of tara from Peru during recent years is given as follows:

Year	Quantity kilograms	Value S/o*
1935	365,667	28,313
1936	448,669	45,379
1937	580,692	67,497
1938	541,711	66,251
1939	490,196	46,024
1940	741,184	95,116

*S/o=1 sol. Current quotations show 6.5 sols to be worth $1.00.

The principal countries of destination, in the order of their importance in 1939, were: Belgium, Great Britain, United States, and France. In 1940 over 85 per cent of the tara exported was in the form of powder and the balance in pods. The present price is about $6.50 per 100 kilograms for powder and $5.00 per 100 kilograms for pods c.i.f. New York.

It is evident that tara is produced in relatively small quantities. Extensive cultivation and expanded production would be necessary if tara is to become a source of tannin ranking with Sicilian sumac.

Tara pods are one of the world's richest sources of tannin. All reports indicate that they produce leathers of the highest quality. The tannin which is predominantly pyrogallol is easily soluble and yields liquors and extracts of relatively low pH, low insolubles, and high purity. In view of these facts tara pods are of particular interest as a possible replacement material at this time when the supplies of Sicilian sumac are cut off because of the European war.

The tara tree was described by the Bureau of Plant Industry[17] in 1915, and at that time was suggested for introduction as an ornamental and a hedge plant or a windbreak in the warmer, drier parts of southwestern

United States. The possible use of its pods in tanning and dyeing was also mentioned. Later introductions were made by the Bureau of Plant Industry in 1925, 1930, and 1937. From these, sixteen plants were grown and set in the Coconut Grove, Florida, garden. Of these there are at present four trees living—one from the 1930 planting, and three from the 1937 planting. Three of the trees range in height from eight to fifteen feet, have a spread of eight to ten feet and a trunk diameter of from one and one-quarter to three inches.

In addition to the above, plantings of tara were made at Coconut Grove, Florida and College Station, Texas in 1940 with seed separated from the tara pods used in this work. Recent reports from these plantings show that eleven potted plants are now growing at Coconut Grove and thirty plants at College Station, Texas.

In the development of our domestic supplies of tanning materials it is desirable to select plants containing tannin bearing parts that are rich in a high-quality tannin and that can be harvested as annual crops. Tara meets these requirements and, if it can be introduced and successfully grown on a commercial scale in southern United States and its tropical possessions, it deserves serious consideration as a domestic source of tannin. Furthermore, tara may serve a dual purpose by becoming a valuable source of tannin and also by furnishing an aid in soil conservation as a windbreak or for the prevention of soil erosion.

Although tara tannin is easily soluble, tanners and extract manufacturers in this country are experiencing difficulty in successfully leaching the pods. This appears to be due to the presence of gummy materials in the pods and seed but may also be aggravated by the comparatively large proportion of very fine powder occurring naturally in the pod. Tara is imported either as original pods, usually so broken up in handling that much of the powdery material is loosened, or as ground pods with seed more or less completely removed. It is reported that attempts at leaching tara in either of the above forms have been unsuccessful due to the formation of gelatinous masses that clog the leaches and prevent efficient removal of tannin, and that mixing ground sumac with tara in the leaches has not overcome the difficulty.

The present studies have been directed mainly toward improvement in methods for handling and leaching tara pods and the production of a high-quality powdered tara extract. A limited number of tanning experiments have been conducted to compare the tanning properties of tara with those of other materials and consideration has been given to the possible utilization of tara gum as a valuable by-product.

A typical sample of commercial tara pods, when separated by hand, gave pod material 65 per cent and seed 35 per cent. The pod material was ground to pass a 2-mm. sieve and analyzed by the Official method of

the American Leather Chemists Association. The results of the analysis calculated to moisture-free basis are shown below:

	Per cent
Total extractive	85.2
Soluble extractive	83.7
Soluble nontannins	23.0
Tannin	60.7
Nonextractive	14.8
Purity (basis of soluble solids)	72.6
pH of water extract	3.1
Total sugars	5.0

This analysis, in conformity with published data, shows that tara pods are extremely high in tannin and should be capable of producing high-purity extracts.

Examination of tara pods after removal of the seed showed that they consisted of a light fibrous material and a naturally occurring, easily separable, fine, dense powder. Since it was thought that this powder might be one cause of clogging of the leaches, it was decided that for leaching experiments the pods as received should be separated into three portions—powdery material, fibrous material, and seed.

A preliminary separation by hand gave 19 per cent powdery material, 52 per cent fibrous material, and 29 per cent seed (Figure III). A more thorough separation was obtained by breaking up, but not grinding, the pods using an Abbe rotary cutter with the knives on the rotor replaced by bars set to give a clearance of about three-eighths of an inch and with a screen having openings of about one-half inch in diameter. This procedure broke up the pods, freed the seed, and loosened all the fine powdery cellular material from the fibrous material. A three-way separation into powdery material, fibrous material, and seed was then made by running through a "Clipper" grain cleaner. Removal of fibrous material from seed was not at first complete and required further treatment. Average results obtained by mechanically separating three batches of pods taken from the same original 100-pound lot were: powdery material, 24.8 per cent; fibrous pod material, 44.5 per cent; and seed, 28.1 per cent. The term "powdery material" refers to the fine powder loosened mechanically from the fibrous pod material and not to the commercial product called "tara powder" obtained when the entire pods freed from seed are ground.

Another possible cause of clogging in the leaches when whole pods and seed are used, is the relatively large amount of gum contained in the seed. This swells easily in water to form a jelly-like mass, particularly if the seeds have been punctured by insects, which is quite commonly the case. Examination of the seed from two lots of pods showed that about 33 per cent by weight were insect-damaged. The fibrous pod material also contains a

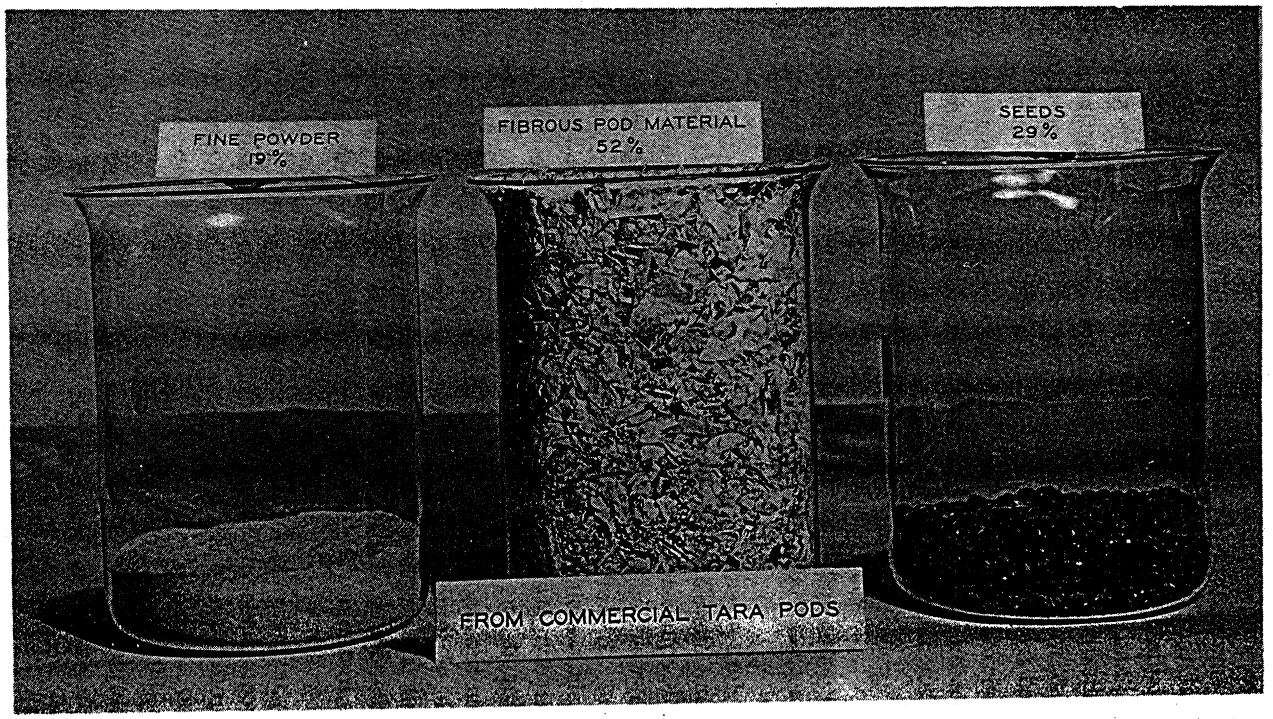

FIGURE III—Proportional Amounts of Powder, Fibrous Material, and Seed.

gummy substance and if ground before leaching this may cause clogging.

To determine tannin content and how powdery, ground and unground fibrous materials, and seed would respond to analytical procedures at different temperatures and concentrations, extractions were conducted by the outside collection procedure of the American Leather Chemists Association, and in the Reed-Churchill extractor[18] at 35° C., 50° C., and 65° C. To facilitate extraction, washed sand was used in the bottom of the extractor and also was mixed with the powdery and ground portions. The data obtained from these experiments are assembled in Table I.

To serve as a basis for the calculation of relative efficiency of extraction, the amount of tannin removed by the outside collection method of the American Leather Chemists Association was taken as the total tannin present. The results obtained on the extraction of the ground fibrous material at 65° C., showing a calculated tannin removal efficiency of 101 per cent, may indicate that the optimum temperature of extraction for this material is lower than that in the method of the American Leather Chemists Association.

The data presented in Table I show that the powdery material from tara pods contains 67 per cent tannin on a moisture-free basis. In tannin and purity it equals some of the best commercial tanning extracts. The fibrous portion with nearly 56 per cent tannin also ranks high as a tannin-bearing material. Extraction of the tannin from the powdery and ground fibrous materials is easily accomplished at low temperatures—98 and 97 per cent, respectively, of the total tannin being removed in the Reed-Churchill extractor at 35° C.

When the amount of material extracted was increased five times and the volume of liquor collected decreased one-half, the efficiency in tannin removal was lowered. This was true for the fibrous portion in both the ground and unground condition and for the mixture of powder and unground fibrous material. Under these conditions extraction at 65° C. gave the best tannin yields. To secure satisfactory extraction it was found essential to avoid packing, particularly in the case of the ground fibrous material. This was accomplished by careful loading of the extractor and wetting the sample by introduction of the water from below. The unground fibrous material gave no trouble from clogging but required a temperature of 65° C. to remove 90 per cent of the total tannin.

Attempts to extract ground seed, a mixture of ground fibrous material, powder, and ground seed, and a mixture of ground fibrous material and powder, were unsuccessful. All of these clogged the extractors so that extraction was impossible. A mixture of unground fibrous material, powder, and whole seed, upon extraction at 35° C., 50° C., and 65° C., yielded, respectively, 80, 88, and 82 per cent of the total tannin. These extractions were slow and gave evidence of partial clogging; as expected they showed

TABLE I

EXTRACTION OF POWDERY AND FIBROUS MATERIAL FROM TARA PODS

(Results on moisture-free basis)

Portion of Pod Used	Temperature of Extraction	Total Extractive per cent	Soluble Extractive per cent	Insolubles per cent	Non-tannins per cent	Tannin per cent	Non-Extractive per cent	Purity (Soluble Solids Basis)	Per Cent Total Tannin Removed*
Extracted by American Leather Chemists Association method, analytical strength, outside collection, 2 liters in 7 hours:									
Powdery material	100° C.	90.0	89.4	0.6	22.4	67.0	10.0	75.1	100
Fibrous material, ground	100° C.	79.4	77.2	2.2	21.4	55.8	20.6	72.3	100
Extracted in Reed-Churchill extractor, analytical strength, 2 liters in 6 hours:									
Powdery material	35° C.	86.5	86.3	0.2	20.6	65.7	13.5	76.2	98.1
Powdery material	50° C.	87.9	87.3	0.6	21.5	65.8	12.1	75.4	98.2
Powdery material	65° C.	88.7	87.5	1.2	21.8	65.7	11.3	75.1	98.0
Fibrous material, ground	35° C.	73.1	73.1	0.0	19.0	54.1	26.9	74.0	97.0
Fibrous material, ground	50° C.	74.9	74.0	0.9	19.8	54.2	25.1	73.2	97.0
Fibrous material, ground	65° C.	77.1	76.5	0.6	20.1	56.4	22.9	73.8	101.0
Extracted in Reed-Churchill extractor, 10X analytical strength, 1 liter in 6 hours:									
Fibrous material, ground**	35° C.	68.1	67.2	0.9	18.3	48.9	31.9	72.8	87.7
Fibrous material, ground**	50° C.	68.2	67.3	0.9	18.1	49.2	31.8	73.2	88.2
Fibrous material, ground**	65° C.	71.3	70.2	1.1	18.5	51.7	28.7	73.6	92.5
Fibrous material, unground	35° C.	60.9	60.8	0.1	17.7	43.1	39.1	70.8	77.1
Fibrous material, unground	50° C.	66.2	65.7	0.5	18.5	47.2	33.8	71.7	84.6
Fibrous material, unground	65° C.	69.9	69.0	0.9	18.5	50.5	30.1	73.2	90.5
Fibrous material, unground, and powdery material	35° C.	70.7	70.7	0.0	18.9	51.8	29.3	73.2	86.5
Fibrous material, unground, and powdery material	50° C.	75.8	74.9	0.9	20.0	54.9	24.2	73.4	91.8
Fibrous material, unground, and powdery material	65° C.	77.5	76.0	1.5	19.8	56.2	22.5	73.9	93.9

*Per cent total tannin removed is calculated on basis of 100 per cent tannin removed by American Leather Chemists Association outside collection method.

**Extraction difficulties overcome by careful loading, and introduction of water from below.

incomplete tannin removal. The results of these analytical extraction studies indicate that, of the various preparations of pod materials used, the unground fibrous material would be the most suitable for large-scale leaching.

Using the solutions obtained in the extractions recorded in Table I, composites were prepared representing, respectively, 35° C., 50° C. and 65° C. extractions of the various parts of tara pods. These solutions were converted by vacuum evaporation to powdered extracts. Their analyses are given in Table II. These are of interest especially in showing that the conversion of the liquors to powdered extracts did not appreciably alter the purity (see Table I).

Since the analytical extraction experiments indicated that the unground fibrous portion of tara pods was the part best suited for large-scale leaching, the subsequent leaching studies were confined to this material.

Leaching was conducted in Pyrex glass vessels 12 inches high and 8.25 inches in diameter, equipped with perforated porcelain false bottoms. The temperature of the leaches was maintained by thermostatically controlled water baths. The decoction process was employed, each leach being operated separately and not as a battery. This gave opportunity to study the nature of each successive liquor removed.

TABLE II

ANALYSES OF POWDERED TARA EXTRACTS PREPARED FROM COMPOSITES OF TANNIN SOLUTIONS OBTAINED IN ANALYTICAL EXTRACTIONS

Extracts Prepared from Tannin Solutions from:	Total Solids per cent	Soluble Solids per cent	Insolubles per cent	Non-Tannins per cent	Tannin per cent	Purity*
Reed-Churchill extractions						
at 35° C.	97.2	96.8	0.4	26.9	69.9	72.2
at 50° C.	96.9	96.5	0.4	25.8	70.7	73.3
at 65° C.	94.9	94.8	0.1	25.3	69.5	73.3

*Calculated on soluble solids basis.

The ratio of water to fibrous material was 5 to 1 for the first addition and approximately 4 to 1 for subsequent ones. Before being put on the leach the water was brought to the desired temperature. Only four leach liquors were taken off—one at the end of each twenty-four hours. After the removal of each liquor the required amount of previously heated fresh water was added. When the liquors were removed volume and barkometer readings were made and the liquors were immediately concentrated in a vacuum pan to liquid extracts; later they were converted to powdered extracts in a vacuum drum dryer.

In one leaching test conducted at 35° C. the four successive liquors removed were converted separately to powdered extracts. The analyses of these, shown in Table III, indicate that the purity and tannin content decrease with each successive extract. An analysis of the composited extracts is also shown in Table III.

TABLE III

ANALYSES OF POWDERED TARA EXTRACTS PRODUCED FROM SUCCESSIVE LIQUORS OBTAINED BY LEACHING UNGROUND FIBROUS POD MATERIAL AT 35° C.

Leach Liquor	Total Solids per cent	Soluble Solids per cent	Insolubles per cent	Non-tannins per cent	Tannin per cent	Purity*
1st	97.4	96.9	0.5	28.1	68.8	71.0
2nd	97.8	97.4	0.4	30.2	67.2	69.0
3rd	97.3	97.1	0.2	34.4	62.7	63.9
4th	97.4	97.1	0.3	39.9	57.2	58.9
Composite**	97.8	97.3	0.5	29.8	67.5	69.4

*Calculated on soluble solids basis.

**Composite of extracts made from the leach liquors.

TABLE IV

ANALYSES OF POWDERED TARA EXTRACTS PRODUCED FROM LIQUORS OBTAINED BY LEACHING UNGROUND FIBROUS POD MATERIAL AT DIFFERENT TEMPERATURES

Leaching Temperature	Total Solids per cent	Soluble Solids per cent	Insolubles per cent	Non-tannins per cent	Tannin per cent	Purity*	pH
35° C.	96.8	96.3	0.5	30.1	66.2	68.7	3.7
50° C.	97.1	96.3	0.8	26.6	69.7	72.4	3.7
65° C.	98.1	95.5	2.6	27.1	68.4	71.6	3.7

*Calculated on soluble solids basis.

To study the effect of leaching at different temperatures upon tannin removal, quality of extract and color, tests were conducted in which unground fibrous material was leached at 35° C., 50° C., and 65° C. These gave yields in terms of liquid extracts which were equivalent, respectively, to 85.7, 86.3, and 86.4 per cent extraction of the total tannin. Thus, the tannin removal appears to be only slightly higher at 50° C. and 65° C. than at 35° C. Although the tannin removal was reasonably good, it is believed that further study would lead to improved leaching processes and higher yields. Analysis of the powdered extracts produced from the liquors obtained in these studies are given in Table IV. These results show that high quality extracts containing low insolubles, high tannin, and high purity can be produced from the unground fibrous material of tara pods. There appears to be little choice between the extracts produced from liquors obtained at 35° C., 50° C., and 65° C. Judging from color tests with skivers these extracts should produce very light-colored thin leathers. With heavier skins or hides tara extract produces more color.

Using the decoction process and the equipment described no difficulty has been experienced in leaching the unground fibrous pod material previously freed from powder and seed. It is quite probable, however, that this material would give trouble in the finely ground form. If the unground fibrous material were leached in large commercial leaches eight to fifteen feet deep with a low ratio of water to material, and at a high temperature, it is possible that leaching difficulties due to packing might occur. It has

been noted that when the proportion of water to original material was at least 4 or 5 to 1 the fibrous material tended to float in the leach. Under these conditions clogging would not be expected. Introduction of water or liquor from below also aids in preventing packing.

It has not been possible in the present study to conduct tests in leaches of commercial size. A simple test, however, has been made of the possibilities of packing in the case of unground fibrous pod material. A tube two inches in diameter and eight feet high was loaded with 800 grams of the fibrous material. Several decoctions were made with water at 50° C., introduced from below. There was no suggestion of stoppage. The results obtained thus far seem to indicate that the unground fibrous material can be leached successfully. A positive conclusion, however, can only be reached after trial in standard commercial leaches.

Tanning experiments with tara and other tanning materials were conducted on unpickled and pickled calfskins, on pickled sheepskins, and on pieces of steer hide. On light leathers tara is capable of producing an excellent "white" color equal to or exceeding that of Sicilian sumac, with no trace of the green chlorophyll coloration that often appears on sumac-tanned leathers. For color comparison, pickled calfskins and sheepskins were quartered and the quarters were tanned with: (1) powdery material from tara pods; (2) ground fibrous material from tara pods; (3) powdered tara extract produced from liquors obtained by leaching unground fibrous pod material at 35° C.; and (4) ground Sicilian sumac. The powdery material gave decidedly the best color and the tara extract the poorest. There was little choice between the colors of the leathers tanned with the ground fibrous material and with sumac. As regards the quality of the leather there appeared little difference between the four tannages.

Tanning tests for the production of heavy leather were conducted with pieces of steer hide. These were tanned with liquors made from tara extract and from other tanning materials. No difficulties were experienced in the tara tannage, and the color produced was lighter than with other tannages, although not of the "whiteness" of tara-tanned light leathers. The tara leather had a tendency to be soft and spongy and of rather low yield. It is possible that these defects could be remedied by extracting or dry dipping after tannage, or by blending tara with other materials during tannage. Preliminary tests have indicated that the final color and feel of leathers tanned with other material may be greatly improved by a short pretannage with tara.

The seed content of commercial lots of tara pods varies but may be considered as approximately one-third the weight of the dry fruit pod. In the portions examined it ranged from 28 to 35 per cent. Some of the variation can be attributed to different degrees of insect damage. In one lot of seed 33 per cent by weight was insect-damaged as against only 5 per cent

in another lot. The average weight of individual damaged seeds in the lot tested was approximately two-thirds that of sound seeds. Damaged seeds are more easily penetrated by water because of the punctures made by the insects.

Examination of tara seeds showed that their approximate composition was: seed coat, 35.7 per cent; endosperm, consisting principally of gum, 32.9 per cent; and yellow fleshy cotyledons, 29.5 per cent.

Laboratory tests indicated that tara gum is quite similar to other gums which have commercial value, such as ghatti, tragacanth, and karaya. Castiglioni[4] has shown it to be almost identical with carob gum which has numerous commercial uses. In view of these observations and because this gum represents roughly 10 per cent of the total weight of dry tara fruit pods, a more extended study is planned to determine the possibilities in the development of the gum as a useful by-product.

Summary

On the basis of the studies described, it would appear feasible to handle tara pods commercially as follows:

Run the pods through a mechanical beater or thresher that will break them sufficiently to remove the seed and loosen the powdery material from the fibrous portion. The machine should not grind the fibrous portion or crack the seed. Make a three-way separation into powdery material, fibrous material, and seed, by means of a machine of the fanning mill or grain cleaner type. Some special adjustment may be required to secure a complete separation of the denser fibrous portions from the seed.

The fine powdery material obtained by the above procedure can be used successfully in the tanning of white leathers by methods closely approximating those regularly employed with ground Sicilian sumac. The tannin content of the powdery material obtained in these studies was 67 per cent on a moisture-free basis.

The coarse fibrous material can be leached in shallow leaches and powdered tara extracts of high tannin, high purity, and low insolubles can be prepared from the leach liquors obtained. The coarse fibrous material, if ground, can also be used in the same manner as Sicilian sumac for producing light-colored leathers. The tannin content of the fibrous material obtained in these studies was 55.8 per cent on a moisture-free basis.

The procedure proposed for handling tara pods should aid in the economical use of this material and assist in overcoming the difficulties experienced in leaching. Use of the unground fibrous material freed from powder and seed will assist in successful leaching. Introduction of water or leach liquor at the bottom of the leach also would be helpful.

Unground fibrous material from tara pods has been successfully leached in shallow leaches without difficulty from clogging. Over 85 per cent of the

total tannin has been removed. The yields were not materially greater with leaching at 65° C. than at 35° C. or 50° C.

High-quality powdered tara extracts have been prepared from liquors obtained by leaching the fibrous pod material at 35° C., 50° C., and 65° C. These show a tannin content ranging from 66.1 to 69.7 per cent and purities of 68.7 to 72.4.

Experimental leathers have been prepared from pickled and unpickled calfskins, pickled sheepskins, and pieces of steer hide which indicate that tara can be successfully used for tanning alone and in blends, and that it can be used to replace Sicilian sumac in tanning "white" leather.

A preliminary study of the gum from tara has been made. Comparison of its reactions with those of other gums of known commercial value indicates a possibility for its development as a valuable by-product.

It is fully appreciated that the data here presented do not adequately cover the subject of leaching tara pods or the possibilities in tara tannages. Nevertheless, because of the present active interest in tara as a replacement material for Sicilian sumac and because of difficulties encountered in its use, it was decided to make available the information thus far acquired with the thought that it may be of assistance to tanners and extract manufacturers in the use of tara.

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